In response to this objection, the abstract has been deleted and a new abstract is attached on a separate sheet.

Claim Objections

Claim 15 is objected to because "portion" is misspelled as "potion" in line 18.

In response to this objection, claim 15 has been amended.

Claim Rejections Under 35 U.S.C. § 102

Claims 15-17 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fujii et al. (U.S. Patent No. 5,426,548). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the invention as claimed and the cited prior art.

The Examiner asserts that Fujii teaches the claimed bearing structure having a hydrodynamic gas bearing, a spindle motor, and hard disk drive including: the fixed components (12, 16, 26), rotatable components (2, 36, 38), and the magnetic fluid (16) located in a region where there is no air flow generated by suction or discharge of a gas for generating hydrodynamic pressure at the hydrodynamic gas bearing, or in the region where the air flow is negligible.

The bearing structure, per claim 15, comprises the following distinguishing features: a hydrodynamic gas bearing, fixed components and rotatable components which are kept in a non-contact state during rotation of the rotatable components, and a magnetic fluid in the region where no gas flow is generated.

The bearing structure of claim 15 requires a hydrodynamic **gas** bearing. Fujii, however, teaches a **liquid,** not a **gas** bearing (column 3, lines 7-8). Though Fujii uses the terminology "fluid-

dynamic pressure" (column 3, line 7), it is clear that the fluid of Fujii is a **liquid**. Throughout the specification Fujii refers to "liquid," "lubricant," and "lubricant liquid" (See column 3, line 48; column 5, lines 5, 16, and 18; column 6, lines 18, 19, and 44; and column 8, line 18). Fujii does not teach or suggest a hydrodynamic gas bearing.

Although Fujii uses the terminology "fluid dynamic pressure," Fujii employs a sliding structure, rather than a hydrodynamic structure, as claimed. As shown in FIG. 1, in the thrust bearing portion, convex surface 68, located at the lower end of the spindle 36, makes electrical contact with the cover 16 (column 5, lines 1-2). Thus, all the weight of the rotatable components, including the rotor hub 38, etc. is supported by this contact when the rotatable components are rotated. Therefore, some form of lubricant is required at the contact point to prevent abrasion of spindle and cover. If gas is used as a medium for developing hydrodynamic pressure in the disk drive of Fujii, friction torque will increase and disk drive components will abrade because gas is not a lubricant.

Furthermore, as taught by Fujii (column 2, lines 10-13), one of the objects of Fujii's invention is to better prevent external scattering of lubricant. Toward this end, Fujii forms reserve grooves 46, 48 to block the scattering of lubricant. If Fujii used a gas for developing hydrodynamic pressure there would be no concern as to scattering lubricant and, therefore, no reason to form the reserve grooves. It is apparent that the use of gas for developing hydrodynamic pressure was not considered by Fujii and is not suggested by the teaching of Fujii. Fujii teaches a hydrodynamic **liquid** bearing, not a hydrodynamic **gas** bearing, as required by claim 15.

Fujii, further, does not disclose the instant bearing structure because Fujii does not teach that the fixed components and the rotatable components are kept in a non-contact state during rotation. In the thrust bearing portion of Fujii where loads in the axial direction are to be borne, "[t]he lower

end surface of the spindle 36 is rounded and convexed downward as at 68, and the apex of this convexed surface is on the axis of rotation of the spindle 36. An electric contact is established between the apex of the convexed surface 68 and the cover 16 . . . " (column 4, line 66 to column 5, line 2). Therefore, all the weight of the rotatable components is borne at this contact point between the convexed surface 68 and the cover 16. This contact point allows electrostatic charge to be discharged.

Fujii further teaches a similar structure in FIG. 2, where a metallic ball 114, disposed inside a hole formed on the top of the spindle 108, bears all the weight of the rotatable components by contacting a cover plate 138. This contact point also allows electrostatic charge to be discharged. FIG. 3 of Fujii illustrates a ball bearing disk drive, which is completely different from a hydrodynamic bearing. Therefore all the disk drives of Fujii employ a sliding type bearing, not a hydrodynamic bearing, in their thrust bearing portions.

Although, the loads in the radial direction are borne by hydrodynamic pressure in the disk drives of Fujii, the loads in the axial direction are fully supported by contact between the components forming thrust bearing portions, not by hydrodynamic pressure.

In contradistinction thereto, the hydrodynamic bearing of the instant invention is provided with a disk shaped thrust plate 6 having grooves 7 for generating thrust hydrodynamic pressure in collaboration with one end of the radial bearing component 5 (page 22, line 23 to page 6, line 23). Accordingly, in operation, thrust hydrodynamic pressure is generated between thrust plate 6 and the radial bearing component 5 which lifts up all the rotatable components, and creates the non-contact condition, as claimed.

Unlike Fujii, the hydrodynamic bearing of the instant invention generates hydrodynamic pressure in both radial and thrust (axial) directions. Therefore, when the rotatable components are

rotated, they are **kept in a non-contact state** with the fixed components, as required by claim 15. In fact, if the rotatable components and the fixed components of Fujii were kept in a non-contact state during rotation by hydrodynamic gas pressure in both the radial and thrust bearing portions, Fujii would not be able to satisfactorily discharge accumulated electrostatic charge on the rotatable components.

The present invention provides a structure that safely and stably discharges accumulated electrostatic charge in the rotatable components onto the fixed components under non-contact conditions. This feature of the present invention is not disclosed or suggested by Fujii.

Fujii also does not disclose magnetic fluid in the region where no gas flow is generated, as required by claim 15. In the instant invention, magnetic fluid is disposed in such a region to a) minimize torque loss due to viscosity of the magnetic fluid, and b) to prevent magnetic fluid from being scattered by centrifugal force by rotation (page 24, line 20 to page 25, line 12). This is accomplished by disposing the magnetic fluid coaxially with the center of rotation of the bearing. Moreover, ring shaped magnet 14 securely positions the magnetic fluid to further prevent scattering.

Fujii, however, uses the magnetic fluid as a hydrodynamic liquid bearing (column 5, lines 13-20). In addition, gas flow is not generated in the case of hydrodynamic bearing, such as the bearing of Fujii. Furthermore, Fujii expressly teaches that "the lubricant liquid between the apex of the convexed surface 68 and the cover 16 is displaced radially outward by the centrifugal force produced as a result of rotation of the spindle 68" (column 5, lines 5-8). Therefore, the magnetic fluid of Fujii is not constrained to a specific location, as in the instant invention.

The factual determination of lack of novelty under 35 USC § 102 requires the disclosure in a single reference of each element of a claimed invention. *Helifix Ltd. v. Blok-Lok Ltd.*, 208 F.3d 1339, 54 USPQ2d 1299 (Fed. Cir. 2000); *Electro Medical Systems S.A. v. Cooper Life Sciences,*

Inc., 34 F.3d 1048, 32 USPQ2d 1017 (Fed. Cir. 1994); *Hoover Group, Inc. v. Custom Metalcraft, Inc,* 66 F.3d 299, 36 USPQ2d 1101 (Fed. Cir. 1995); *Minnesota Mining & Manufacturing Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992); *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051 (Fed. Cir. 1987). Because Fujii does not disclose a hydrodynamic gas bearing, fixed components and rotatable components which are kept in a non-contact state during rotation of the rotatable components, and a magnetic fluid in the region where no gas flow is generated, as required by claim 15, Fujii does not anticipate claim 15.

Applicants further submit that Fujii does not suggest the claimed bearing structure.

The dependent claims further distinguish the claimed invention. For example claim 16 requires a spindle motor having the claimed bearing structure. Claim 17 requires a hard disk drive having a spindle motor with the claimed bearing structure. Fujii does not suggest a spindle motor or hard disk drive with these additional limitations.

In light of the Amendments and Remarks above, this application should be considered in condition for allowance. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning at line 5 of page 5 has been rewritten as follows:

The electrostatic charge, if it is accumulated to a certain extent, can cause an electrostatic discharge between, for example, the disc section 110 and the head section 120 of the HDD (see Fig. 10). This may in turn [damages] damage the head assemblies 121, the storage media 90, and other HDD components. The same [problems] problem can occur in [another] other bearings such as magnetic and hydrostatic gas bearings in which the rotatable components [is] are rotated without any contact with the fixed components.

The paragraph beginning at line 18 of page 8 has been rewritten as follows:

However, the structure disclosed in Japanese Patent Laid-Open Publication (A) No. 55916/1999 has some problems. For generating hydrodynamic pressure in this bearing structure, a gas should extend between the radial bearing components 144 and 145, between the thrust bearing components 144 and 146, and between the thrust bearing components 144 and 147. In the structure as shown in Fig. 12, an opening to feed/discharge the gas is, as shown with an arrow 150 in the drawing, provided only at the upper end or the lower end of the spindle motor. Consequently, as is clear from the drawing, the gas flow for generating the hydrodynamic pressure passes through a sealing layer sealed by the magnetic fluid 153. Depending on the specifications and working conditions of a bearing, as well as the properties of a sealing component to be used, the incoming gas flow may break the magnetic sealing layer, and the high-speed rotation of the rotor hub 143 may splash the magnetic fluid 153. Once the magnetic fluid 153 is splashed, the rotatable components [bring into non-contact] are no longer in contact with the fixed components, as [the] a consequence of which the electrostatic charge may [be]

build up in the rotatable components, leading to possible damages on the HDD.

The paragraph beginning at line 16 of page 9 has been rewritten as follows:

Another problem is [an increase of] increased power consumption. When the peripheral speed of the rotatable components sealed by the magnetic fluid 153 becomes higher to a certain extent, the magnetic fluid 153 filling the gap between the fixed components and the rotatable components develops a large viscous resistance. This increases the rotational driving torque and consequently increases the power consumption. In addition, an increase of the viscous resistance causes generation of heat, which increases the temperature of the whole HDD.

The paragraph beginning at line 1 of page 10 has been rewritten as follows:

When ceramics, which [is] are generally nonconductive and [has] have high abrasion resistance, [is] are used at the bearing sections, it is impossible to discharge electrostatic charge built up in the rotatable components even if the bearing components are in a contact state at the time the spindle motor stops. As a result, damages on the HDD may occur by the accumulation of electrostatic charge, which may lead to forced replacement of ceramics with conductive materials such as a stainless steel, even though ceramics [has] have good abrasion resistance as bearing components.

The paragraph beginning at line 23 of page 14 has been rewritten as follows:

Yet another aspect of the present invention relates to a bearing structure, wherein the conductive ceramics [is] are made of [Al_2O_3-30vol%TiC] Al_2O_3-30 vol.% TiC, TiB_2, or [Si_3N_4-30vol%Tin] Si_3N_4-30 vol.% TiN.

The paragraph beginning at line 1 of page 27 has been rewritten as follows:

In this embodiment, ceramics having desirable properties for a bearing component such as high abrasion resistance and rigidity [is] are used as [a material] materials for the

hydrodynamic bearing components. When the spindle motor stops, these bearing components come into contact with each other, enabling the discharge of electrostatic charge built up in the rotatable components to contacted fixed components. To implement discharge of electrostatic charge, the bearing components 16, 17, and 18 are made of conductive ceramics. Specifically, these bearing components are made from ceramics having conductivity as well as high abrasion resistance, such as [Al_2O_3-30vol%TiC] Al_2O_3-30 vol.% TiC, TiB_2, or [Si_3N_4-30vol%Tin] Si_3N_4-30 vol.% TiN or others.

IN THE CLAIMS:

Claim 15 has been amended as follows:

15. (Amended) A bearing structure having a hydrodynamic gas bearing, comprising:

fixed components; and

rotatable components which are supported by the fixed components for rotation,

wherein the fixed components and the rotatable components are kept in a non-contact state during rotation of the rotatable components,

the bearing structure further comprising a conductive structure having a magnetic fluid for electrically connecting the fixed components and the rotatable components either in the region where there is no [air] gas flow generated by suction or discharge of a gas for generating hydrodynamic pressure at the hydrodynamic gas bearing [potion] portion, or in the region where the [air] gas flow is negligible.